

SHARP

No: RD-96930

RELIABILITY TEST REPORT

Product Type : Smart voltage 8M bit flash memory

Model No. : LH28F008SCT

Package : 40Pin TSOP (TSOP040-P-1020)

Date : OCT. 2, 1996


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1. Quality Assurance And Reliability Testing During New Product Development

New product development begins with establishing reliability targets during the planning stage. During this stage the end applications functions and requirements are also considered in addition to the reliability targets.

Quality and reliability are built into the product from the start by having design and reliability review sessions in the development and design stages. This insures that quality and reliability levels are maintained at the preproduction and mass production stages.

2. Reliability Test Methods

Reliability tests should always have good reproducibility. Thus, reliability tests for IC devices are based upon standardized test methods. Such uniform testing standards include those established by JIS(Japanese Industrial Standard), MIL-STD(U.S. Military Standard), EIAJ(Electronic Industries Association of Japan) and IEC(International Electrotechnical Commission). Sharp has based its own testing methods on these standards.

3. Evaluation Results

The results attached show that Sharp has met the high quality and reliability targets which are required by the above standards.

Note: This evaluation has been performed upon a representative product which is selected from a series of related products with the same basic design, all packaged in the same package type. Therefore, these evaluation results are applicable for the following Sharp models:

LH28F008SCT, LH28F008SCR

4. Other Considerations

Please confirm that the specifications of this product meet the requirements of the application.

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1-1. ENDURANCE TEST-1

| No. | Test | Conditions | Reference Standards | Number of Samples | Number of Failures / Test Time | | | LTPD |
|-----|-------------------------------|--|---------------------------------------|-------------------|--------------------------------|------|--------|------|
| | | | | | 240h | 500h | 1 000h | |
| 1 | High Temperature Operation | Ta=125°C V _{CC} /V _{PP} =6.5V 1 000h | JIS C 7022:B-1 MIL-STD-883C 1005.6 | 153 | 240h | 500h | 1 000h | 1.5% |
| | | | | | 0 | 0 | 0 | |
| 2 | High Temp. Storage | Ta=140°C 1 000h | JIS C 7022:B-3 MIL-STD-883C 1008.2 | 45 | 240h | 500h | 1 000h | 5% |
| | | | | | 0 | 0 | 0 | |
| 3 | Low Temp. Storage | Ta=-65°C 1 000h | JIS C 7022:B-4 | 11 | 240h | 500h | 1 000h | 20% |
| | | | | | 0 | 0 | 0 | |
| 4 | High Temp. High Humi. Storage | Ta=60°C, 90%RH 1 000h | JIS C 7022:B-5 | 22 | 240h | 500h | 1 000h | 10% |
| | | | | | 0 | 0 | 0 | |
| 5 | High Temp. High Humi. Bias | Ta=85°C, 85%RH V _{CC} /V _{PP} =5.5V 1 000h | JIS C 7022:B-5 | 76 | 240h | 500h | 1 000h | 3% |
| | | | | | 0 | 0 | 0 | |

1-2. ENDURANCE TEST-2

| No. | Test | Conditions | Reference Standards | Number of Samples | Number of Failures | LTPD |
|-----|-----------------------|---|--|-------------------|--------------------|------|
| 6 | Thermal Shock | Ta=-65°C(5min)~150°C(5min) 100cyc | JIS C 7022:A-3 MIL-STD-883C 1011.7 | 45 | 0 | 5% |
| 7 | Temp. Cycling | Ta=-65°C(30min)~150°C(30min) 500cyc | JIS C 7022:A-4 MIL-STD-883C 1010.7 | 76 | 0 | 3% |
| 8 | Temp. & Humi. Cycling | Ta=-10°C~65°C, 90~96%RH 1cyc/24h 10cyc | JIS C 7022:A-5 MIL-STD-883C 1004.7 | 22 | 0 | 10% |
| 9 | Solt Atmosphere | Solt Concentration=5wt% Solt Fog Temp. =35°C Spray Rate=10~50g/m ² /d 24h | JIS C 7022:A-12 MIL-STD-883C 1009.7 | 22 | 0 | 10% |

CRITERIA

No. 1 ~ 8 : To maintain electrical characteristics within the limits established in the specifications of each device.

No. 9 : To maintain electrical characteristics within the limits established in the specifications of each device.

There is no evidence of damage to the body material or lead finish of each device. All package marking is remain visible to the naked eye.

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I-3. ENDURANCE TEST-3

| No. | Test | Conditions | Reference Standards | Number of Samples | Number of Failures | LTPD |
|----------------|--|-----------------------------------|---------------------|-------------------|--------------------|------|
| 10 | [Series Test] Baking | Ta=150°C 20h | EIAJ ED-4701:B-101 | 22 | 0 | 10% |
| | ↓ | Ta=30°C, 70% | | | | |
| | Moisture Absorption | 96h | | | | |
| | ↓ | | | | | |
| I. R Soldering | Highest Temp. =240°C, 230°C-240°C, 15s | | | 0 | | |
| ↓ | Ta=121°C, 100%RH, No Bias | | | 0 | | |
| PCT | 2×10 ⁵ Pa(2atm), 100h | | | | | |

CRITERIA

No. 10 : To maintain electrical characteristics within the limits established in the specifications of each device.

There is no evidence of damage to the body material (i. e. Package cracking)

2. ERASE/WRITE CYCLING TEST

| No. | Test | Conditions | Number of Cycles | Number of Samples | Number of Failures | Failure Rate | Note |
|-----|----------------------------|------------|------------------|-------------------|--------------------|---------------|----------------------|
| 1 | Erase/ Write Cycling | Ta=0, 70°C | 10k | 752 | 0 | 76 DPM/Block | Confidence Level=60% |
| | | | 100k | | 0 | 305 DPM/Block | |

CRITERIA

No. 1 : To maintain electrical characteristics within the limits established in the specifications of each device.

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3. MECHANICAL TEST

| No. | Test | Conditions | Reference Standards | Number of Samples | Number of Failures | LTPD |
|-----|-----------------------------|--|--|-------------------|--------------------|------|
| 1 | Vibration | 100~2 000~100Hz. 4min 200m/s ² (20G) X, Y, Z each 4times, total 48min | JIS C 7022:A-10 MIL-STD-883C 2007.1 | 11 | 0 | 20% |
| 2 | Shock | 15 000m/s ² (1 500G) 0.5ms, ±X, ±Y, ±Z each 3 times | JIS C 7022:A-7 MIL-STD-883C 2002.3 | 11 | 0 | 20% |
| 3 | Acceleration | 200 000m/s ² (20 000G) ±X, ±Y, ±Z each 1 min | JIS C 7022:A-9 MIL-STD-883C 2001.2 | 11 | 0 | 20% |
| 4 | Terminal Strength (Bending) | A specified load $\frac{3}{4}$ is applied to the tip of each lead is bent once through a 90° arc and back. 0.25 · 0.5 · 1.25 N 1 time | JIS C 7022:A-11 MIL-STD-883C 2004.5 | 5 | 0 | 50% |
| 5 | Terminal Strength (Tension) | A specified load $\frac{3}{4}$ is applied in a direction parallel to the lead axis. 0.5 · 1.0 · 2.5 N 10s | JIS C 7022:A-11 MIL-STD-883C 2004.5 | 5 | 0 | 50% |
| 6 | Solderability | 230°C 5s Used with rosin flux | JIS C 7022:A-2 MIL-STD-883C 2003.5 | 11 | 0 | 20% |

$\frac{3}{4}$ The specified load is determined by nominal cross section.

CRITERIA

- No. 1, 2, 3 : To maintain electrical characteristics within the limits established in the specifications of each device.
- No. 4, 5 : There is no evidence of damage to the body. There is no broken or cracked lead (terminals).
- No. 6 : Lead coverage of at least 95% with a continuous solder coating. Pinholes and voids are not concentrated in one area and exceed 5% of the total area.

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4. MISCELLANEOUS

| No. | Test | Conditions | Reference Standards | Number of Samples | Number of Failures | LTPD |
|-----|-----------------------|--|--|-------------------|--------------------|------|
| 1 | Permanence of Marking | 20~25°C. Brushing 5 times after dipping 10 minutes | EIAJ ED-4701:C-121 (Solvent):Acetone, Butyl acetate, Isopropyl alcohol, Ethyl alcohol | 11(each) | 0 | 20% |

| No. | Test | Conditions | Reference Standards | Number Of Samples | Condition | ESD/Latch-up Strength | | | | |
|-----|---------------------------|--|----------------------------|-------------------|-----------|-----------------------|--------|--------|--------|--|
| | | | | | | ≥0.4kV | ≥0.6kV | ≥0.8kV | ≥1.0kV | |
| 2 | Electro-static discharges | C=100pF R=1.5kΩ | EIAJ ED-4701 C-111 | 3(each) | GND, + | | | | ○ | |
| | | | | | GND, - | | | | ○ | |
| | | | | | VCC, + | | | | ○ | |
| | | | | | VCC, - | | | | ○ | |
| 3 | Latch-up | Current application test Tp=10ms, Toff=500ms, VccMAX. | EIAJ ED-4701-1 C-113 | 3(each) | | ≥40mA | ≥60mA | ≥80mA | ≥100mA | |
| | | | | | + | | | | ○ | |
| | | | | | - | | | | ○ | |

"○" Pass, "×" NG, "-" No measurement

CRITERIA

- No.1: There is no evidence of damage to the device and package marking which are no missing in whole or in part.
- No.2: To maintain electrical characteristics within the limits established in the specifications of each device.
- No.3: No latch-up occurs.

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LH28Fxxx FLASH MEMORY FLASH NON-VOLATILE MEMORY FLASH E2ROM FLASH ROM
READ ONLY MEMORY ETOX